

GHRC Lightning Activities

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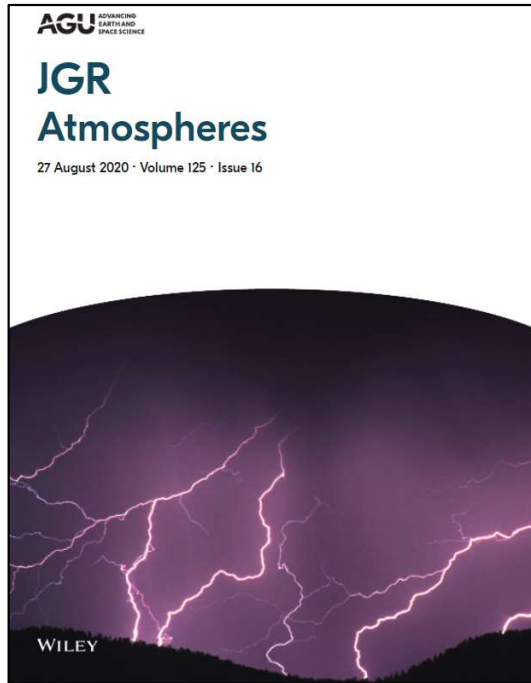
Sherry Harrison



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GHRC User Working Group 2020

Lightning Data at the GHRC DAAC

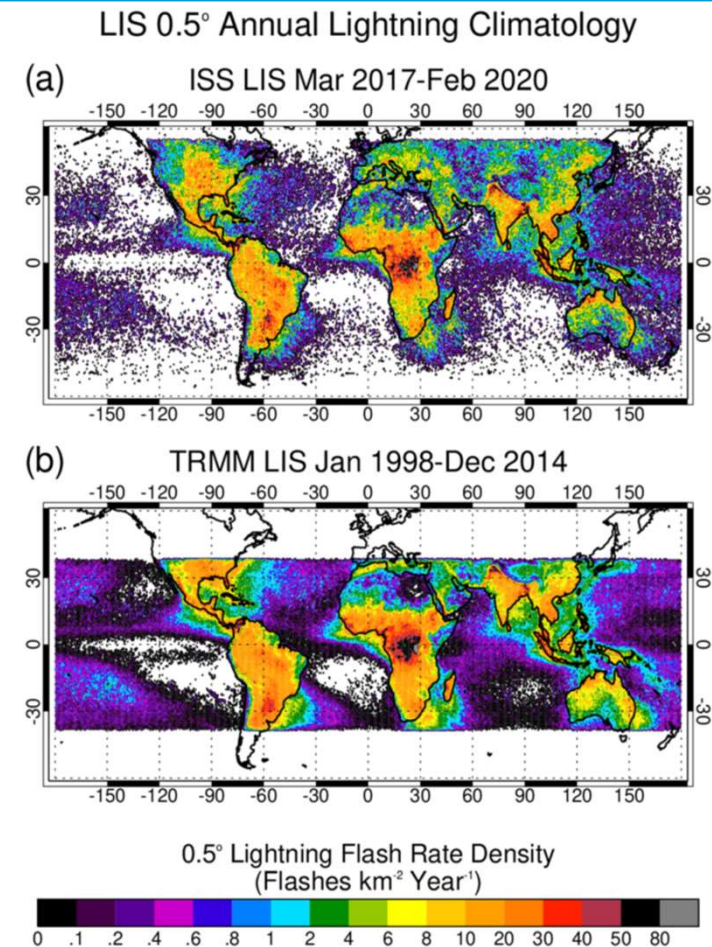


Cover of JGR – Atmospheres the
“First 3 years of LIS article”

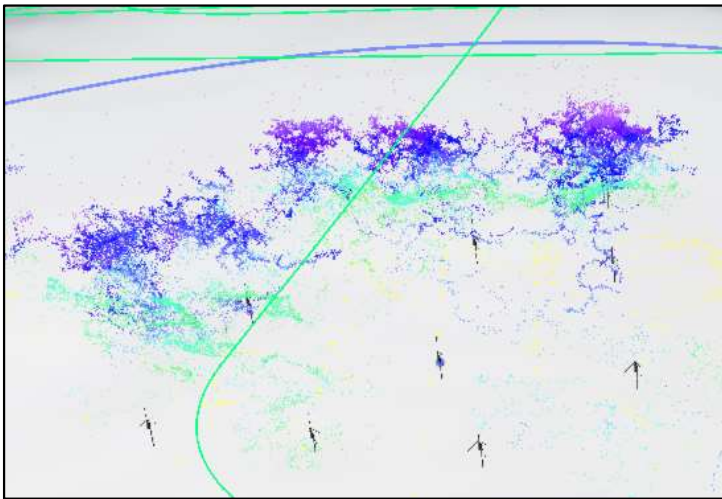
- GHRC is known as the lightning DAAC
- Lightning data are a flagship dataset for GHRC
 - High visibility
 - Top downloaded dataset for FY2020
- Successful year for GHRC
 - Optical Transient Detector data recipe
 - Three new datasets accepted for publication
 - Directly and indirectly support ~10 journal publications
 - One journal article in review with Michael Peterson
 - Collaborative journal article led by Timothy Lang accepted as the editor’s choice for Journal of Geophysical Research - Atmospheres

Lightning Imaging Sensor (LIS)

- LIS data (both from the International Space Station [ISS] and Tropical Rainfall Measuring Mission) remain defining datasets for GHRC
- ISS LIS remains operational
 - Best case scenario until 2026 + 2 years closeout
 - ~10 years of data, as well as 17 years of TRMM LIS
- Version 2 validated code being prepared
 - Several improvements
 - Use time versus orbit number in the file name
- Continues to be used by several National Weather Service National Centers



North Alabama Lightning Mapping Array (NALMA)

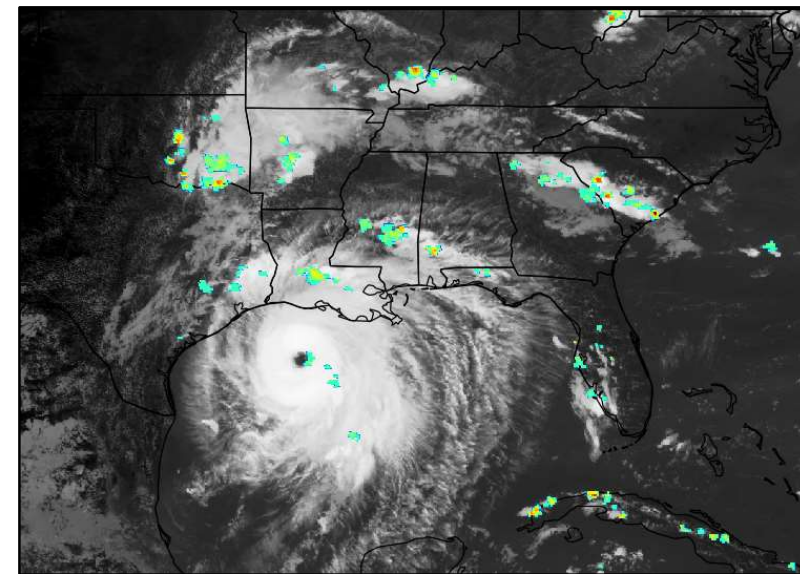


Example of Lightning Mapping Array data in the Field Campaign Explorer

- GHRC coordinating with the Lightning Science Team on renewing work with NALMA
 - Network has been offline several years
- NALMA is operational now
 - GHRC coordinating on real-time processing in the cloud
- Data shared with NASA SPoRT
 - Data are gridded and then provided to the local National Weather Service office
- NALMA demonstrator for other LMAs
 - Washington D.C. likely next
- Viewable in Field Campaign Explorer
 - Gridded products to follow

New Datasets: Part I

- Three new lightning datasets accepted for publication at GHRC DAAC
- For the Geostationary Lightning Mapper (GLM)
 - “Beta” data from the GOES-R Post Launch Test
 - GLM-CIERRA (next slide)
 - Hemispheric, gridded products (Level 2)
- Archiving GLM is a major win for GHRC
 - High visibility, ongoing product
 - Compliments ISS LIS data
 - Spatial and temporal coverage enable broad research opportunities
 - Continued demonstration of GHRC capabilities for future high data volume, high temporal resolution data

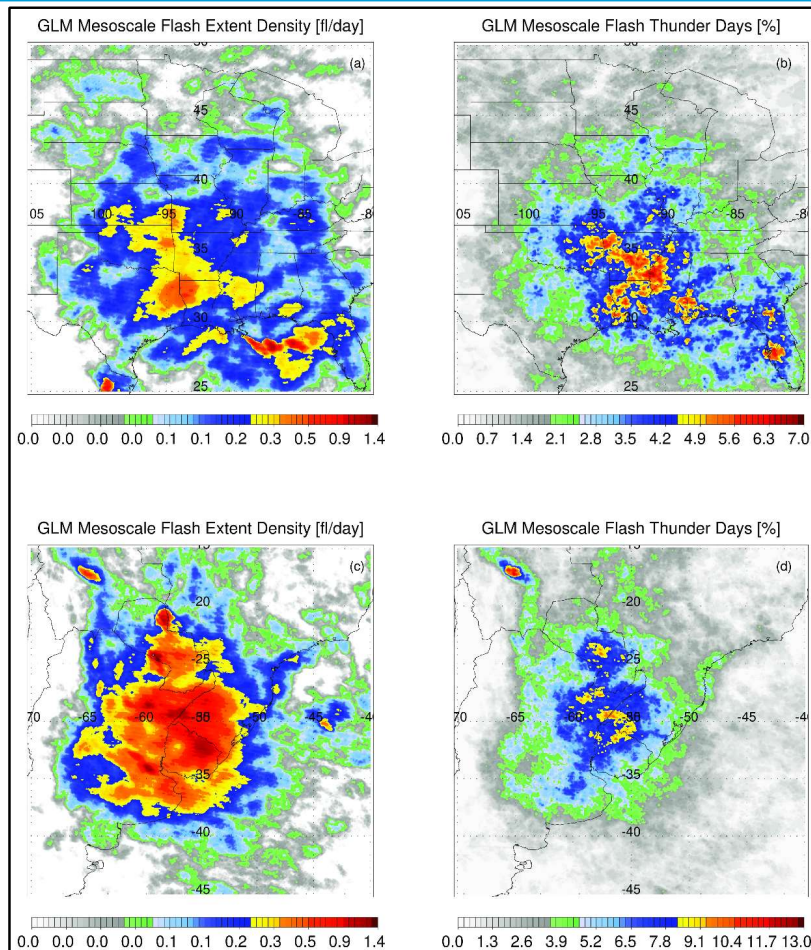


Hurricane Laura, 2010 UTC, 26 August 2020

New Datasets: GLM-CIERRA

- **CIERRA – Cluster Integrity, Exception Resolution and Reclustering Algorithm [Peterson 2019]**
 - Built upon Peterson's earlier work with OTD and LIS
 - Utilizes the GLM's Lightning Cluster Filter Algorithm (LCFA)
 - Identifies where LCFA flags degraded flashes (exceeding real-time requirement thresholds)
 - Reconstructs a flash from multiple degraded flashes – Better flash extent values!
 - <http://dx.doi.org/10.5067/GLM/CIERRA/DATA101>
 - Developing plan for ongoing data production
 - Dr. Peterson recently awarded for the CIERRA algorithm

GHRC Projects with GLM-CIERRA



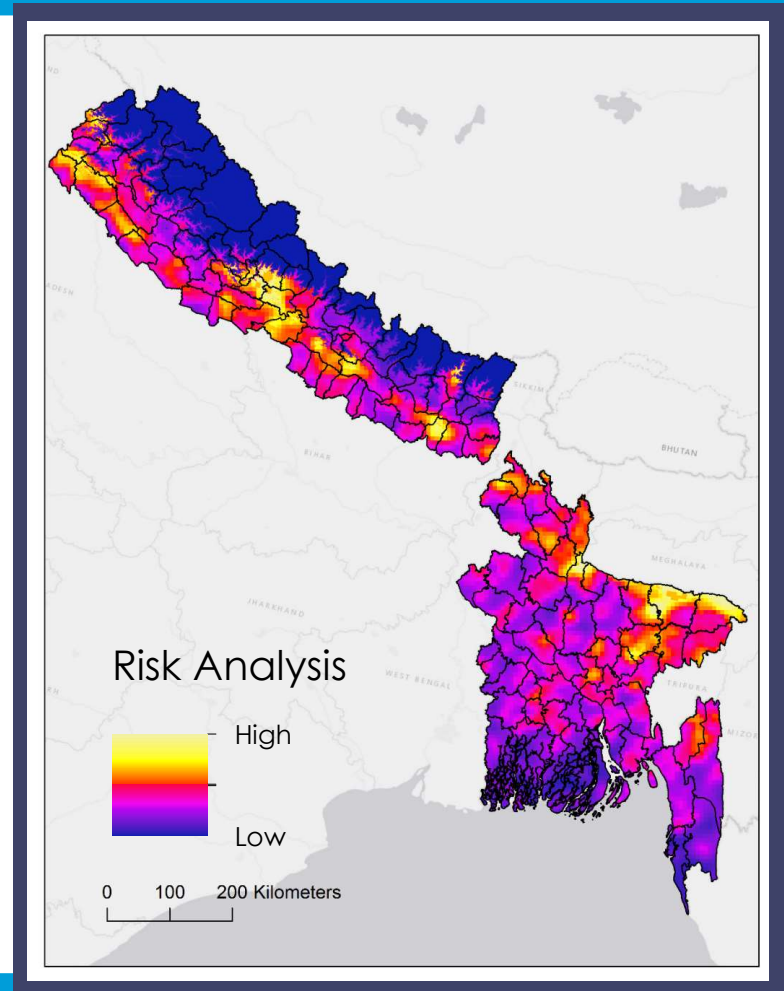
Flash extent density of flashes per day exceeding 100 km in 2018-2019 (left column) for the eastern two-thirds of the U.S. (top) and southeast South America (bottom). The right column shows the percentage of thunderstorm days with flashes exceeding 100 km.

Image courtesy of Dr. Michael Peterson

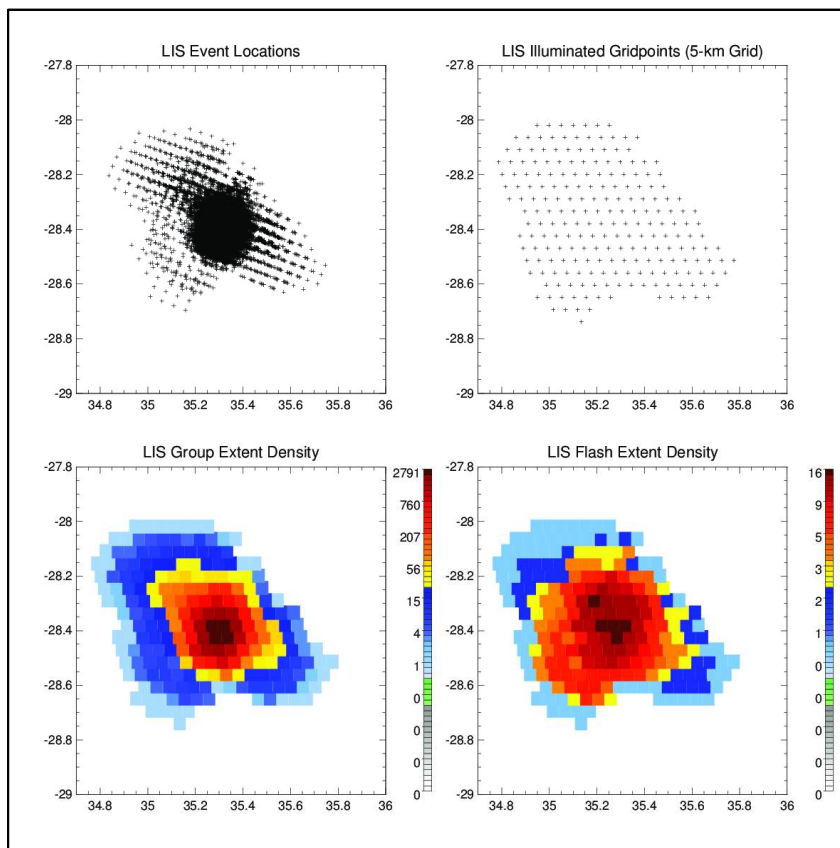
- Want to investigate the occurrence of megaflashes
 - Defined at ≥ 100 km in extent
- Questions to ask:
 - Where and when do megaflashes occur?
 - How often do they occur?
 - Is there a level of predictability?
 - How can these answers impact lightning safety?
- Journal article “Megaflash Hazards” under review
 - Michael Peterson and Geoffrey Stano

GHRC Projects for Lightning Safety

- GHRC Master's student, Essence Raphael, conducting lightning risk assessment
- Derived from previous work she performed with NASA DEVELOP (right)
- Combined socio-economic data with TRMM LIS observations to develop lightning risk
- Master's work working to generate similar product for southeastern United States
 - Variety of data for development / validation
 - Establish guidelines for potential, global product

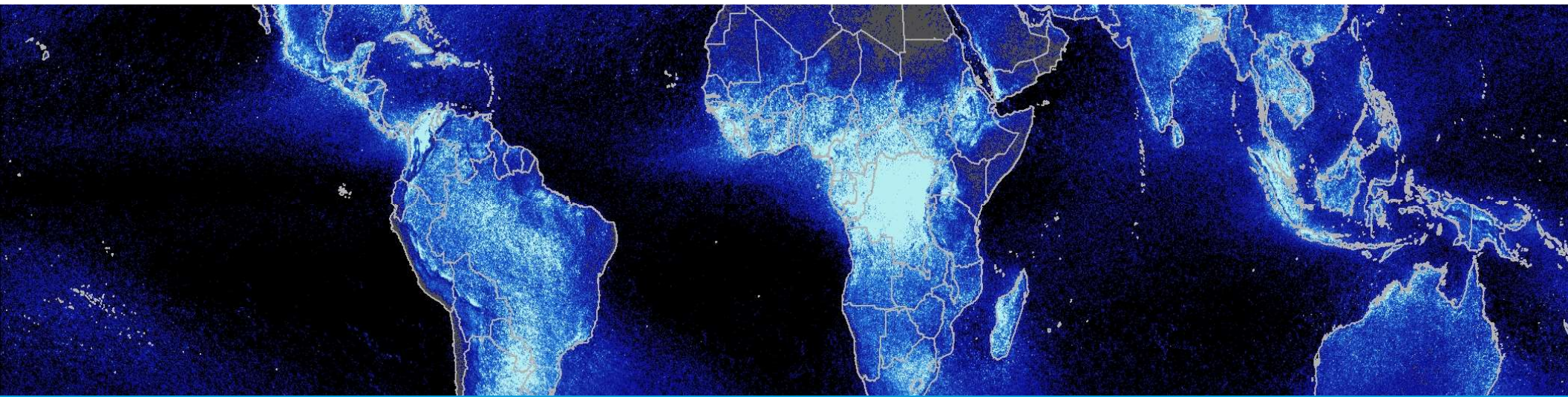


Looking Ahead



LIS-CIERRA example (courtesy Michael Peterson)

- CIERRA algorithm can be extended to the Optical Transient Detector and Lightning Imaging Sensor (left)
- Potential collaborations with Los Alamos National Laboratory
 - Public release Fast On-orbit Rapid recording of Transient Events (FORTE)
 - August 1997 – 2010: Overlaps TRMM LIS
 - VHF observations of lightning up to 70 degrees N/S
 - STPSat-6 SENSR (FORTE follow-on)
- Questions for the User Working Group
 - Recommendations to engage Kennedy Space Center and their extensive meteorological observations
 - Options to continue to showcase GHRC lightning data



THANK YOU!

QUESTIONS?

